Issue Paper
Maximum ground motions (S_s) for low rise regular buildings

ISSUE:

ASCE 7 Section 12.8.1.3 allows the seismic design base shear used to design the lateral force resisting system of buildings to be capped at a maximum mapped short period acceleration (Ss) of 1.5 if the building has no structural irregularities, is less than 5 stories high, and has a fundamental period of vibration less than 0.5 seconds. This essentially aligns the design base shear to values used in the 1994 UBC for Seismic Zone 4. Since then, the ground motion values have significantly increased in areas near major earthquake faults. ASCE 7 continues to allow this exception.

Under the 2013 CBC, new mapped spectral acceleration values show that the maximum Ss in California will be about 3.73 and the site specific short period acceleration are sometimes even higher. Permitting a cap on Ss of 1.5, will mean a reduction of more than 60% from the maximum mapped value. Most of these regular structures are designed with a Redundancy Factor, ρ = 1.0, compared with 1.3 for most irregular structures. This means irregular structures may potentially be designed for a force of about 3.2 times that of a regular structure at the same site. Historical records of building performance don't justify such a large advantage for the regular structures. DSA and OSHPD are proposing a 25% maximum reduction in Ss, which seems to be more appropriate. Recent ATC – 58 project analysis suggested lower R values for low rise buildings, which also justify the proposed amendment.

PROPOSAL:

Add the following section to 2013 CBC Chapter 16A:

1616A.1.12 ASCE 7, Section 12.8.1.3. *Replace ASCE 7 Section 12.8.1.3 by the following:*

12.8.1.3 Maximum S_S Value in Determination of C_S. *For regular structures five stories or less above the base as defined in Section 11.2 and with a period, T, of 0.5 s or less, C_S is permitted to be calculated using the larger of either S_S =1.5 or 75% of the value of S_S determined per Sections 11.4.1 or 11.4.7.*

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